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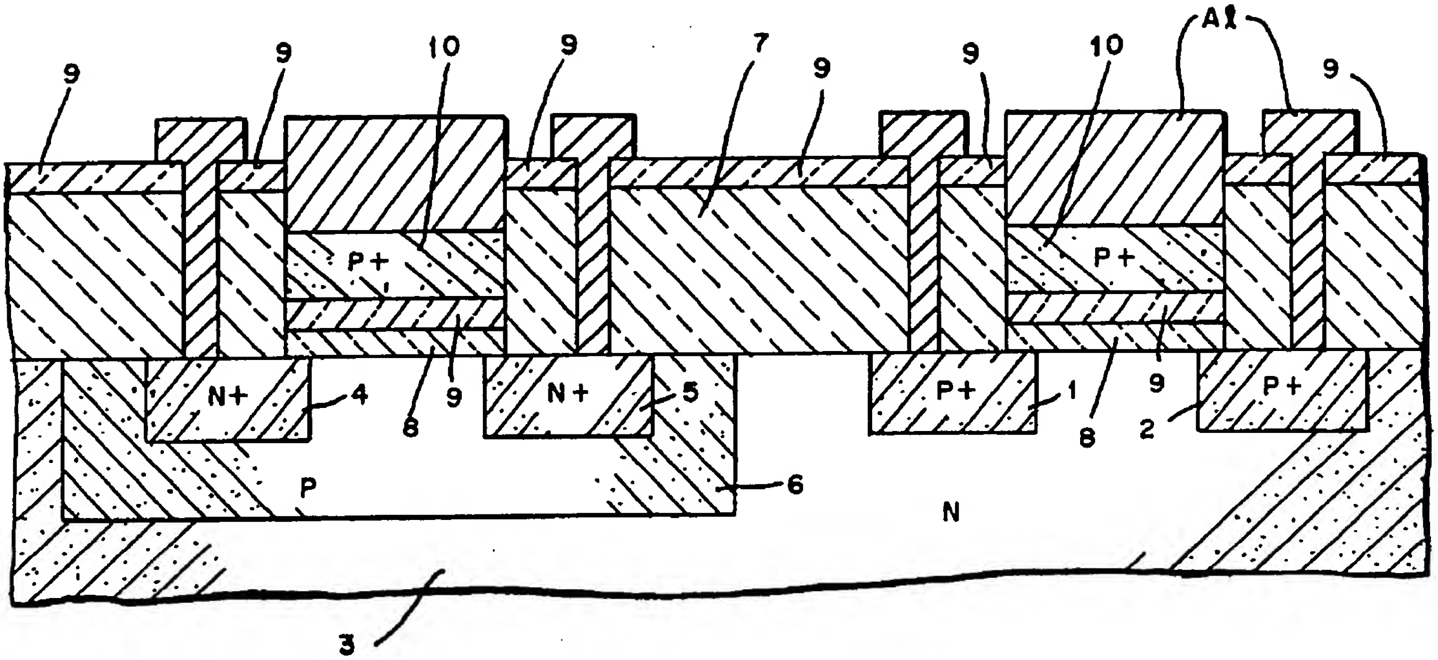
DISCLOSURE TEXT:

2p. Prior complementary field-effect transistor (FET) devices employ aluminum-silicon nitride-silicon oxide gate structures. Such gate structures are subject to three disadvantages, i.e., the P-channel FET exhibits high-threshold voltage, the N-channel FET exhibits low-threshold voltage, and both P and N-channel FETs are subject to significant threshold voltage shift in response to temperature-bias stressing. - The foregoing disadvantages are avoided by employing an aluminum, P-doped polycrystalline silicon, oxygen annealed silicon nitride, thermal oxide gate structure. A P-doped polycrystalline silicon gate has a more positive gate-to-substrate work function than an aluminum gate. Therefore, with everything else equal, N-channel FETs with an aluminum silicon gate have a substantially higher threshold voltage than N-channel aluminum gate FETs. The corresponding P-channel devices have a much lower threshold voltage than aluminum gate P-channel FETs. The oxygen annealing of the silicon nitride layer improves the threshold voltage stability of both the P and N-channel FETs. - The complementary FET devices shown in the drawing are fabricated as follows: P diffusions 1 and 2 are made in N substrate 3, N diffusions 4 and 5 are made in P pocket 6 formed within substrate 3, and thick oxide 7 is formed in a conventional manner. The thick oxide is etched away in the device channel area and relatively thin gate oxide 8 is regrown. Silicon nitride 9 is deposited on the gate oxide and then subjected to an oxygen annealing step, for example, at 1050 degrees C for one hour using dry O(2). Polycrystalline silicon 10 is deposited on the oxidized nitride layer and is P-doped either by subsequent diffusion or simultaneously with the deposition of the polysilicon. A thin layer of thermal oxide is then grown on the polycrystalline silicon in order to improve photoresist adherence. Contact photoresist is applied and windows are opened in the composite layer consisting of thin silicon oxide, polycrystalline silicon, silicon nitride and thick oxide layer 7. Aluminum is deposited and is subtractively etched along with the polysilicon. Finally, the entire structure is sintered.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